IN THE CLAIMS:

Please note that all claims currently pending and under consideration in the referenced application are shown below. Please enter these claims as amended. This listing of claims will replace all prior versions and listings of claims in the application.

1. (Currently Amended) A system for the continuous use and recapture of a catalyst in liquid, comprising:

an inlet;

an upwardly oriented reaction zone coupled to the inlet and including a generally downwardly flowing carrier liquid;

a flotation chamber including disposed therein a catalyst consisting of buoyant particles, the flotation chamber disposed below and communicating with the reaction zone, and configured such that the downward flow velocity of the liquid is reduced upon entering the flotation chamber to a velocity wherein the buoyancy of the catalyst particles causes them to flow upward;

an outlet coupled to the flotation chamber; and

an upwardly oriented catalyst recovery chamber coupled above the flotation chamber and containing a catalyst consisting of buoyant particles suspended in the liquid, the catalyst recovery chamber, flotation chamber, and reaction zone configured such that catalyst particles are drawn out of the catalyst recovery chamber into the reaction zone, and are drawn downward with the liquid into the flotation chamber for recycling to the catalyst recovery chamber.

2. (Original) The system of claim 1, wherein the reaction zone is substantially vertical.

3. (Original) The system of claim 2, further comprising:

a catalyst recovery inlet disposed at a bottom of the catalyst recovery chamber and approximately centrally located within the flotation chamber; and

rotational flow structure coupled to the flotation chamber for inducing rotational flow about the center of the flotation chamber, such that the buoyant catalyst particles are urged toward the catalyst recovery inlet to the catalyst recovery chamber.

4. (Original) The system of claim 3, wherein the catalyst recovery inlet comprises a downwardly oriented cone having openings formed therein.

5. (Original) The system of claim 4, wherein the catalyst recovery inlet further comprises fins disposed on an outer side of the cone, the fins configured to assist catalyst particles in entering the openings formed in the cone.

6. (Original) The system of claim 3, wherein the rotational flow structure comprises a magnetic stirrer disposed adjacent the flotation chamber.

7. (Original) The system of claim 1, wherein the reaction zone is substantially non-vertical.

8. (Currently Amended) A photoreactor system, comprising:

a generally upright outer cylinder;

an inner cylinder disposed generally coaxially within the outer cylinder and defining an annular reaction zone therebetween, the inner cylinder having an inlet at a bottom thereof for allowing inflow of buoyant photocatalyst particles, and an orifice disposed at a top thereof for allowing outflow of the buoyant photocatalyst particles into downwardly flowing liquid in the reaction zone;

means for directing light into the reaction zone, whereby the photocatalyst particles may induce photo-chemical reactions within the liquid; and

a flotation chamber communicating with and disposed at a bottom of the outer cylinder and configured to substantially reduce the flow velocity of the liquid upon exiting the annular reaction zone to a velocity wherein the buoyant ~~microspheres~~ photocatalyst particles are allowed to float upward through the inlet of the inner cylinder.

9. (Currently Amended) The photoreactor of claim 8, further comprising means for inducing rotational flow in the flotation chamber about the center of the flotation chamber, such that the buoyant photocatalyst particles are urged toward the inlet to the catalyst recovery chamber.

10. (Currently Amended) The photoreactor of claim 9, wherein the means for inducing rotational flow is selected from the group ~~comprising~~ consisting of a magnetic stirrer disposed adjacent the flotation chamber and spiral vanes disposed within the annular reaction zone.

11. (Original) The photoreactor of claim 8, wherein the photocatalyst is selected from the group consisting of zinc oxide (ZnO) and titanium dioxide (TiO_2).

12. (Currently Amended) The photoreactor system of claim 8 wherein:

the liquid comprises cyanide contaminated water;

the inlet to the inner cylinder comprises a downwardly oriented perforated cone approximately centrally located within the flotation chamber;

the means for directing light into the reaction zone comprises a variable contour reflector; and further comprising:

a water inlet for introducing the liquid into the top of the photoreactor;

means for inducing rotational flow around the perforated cone such that the buoyant photocatalyst particles are urged toward the cone; and

a water outlet at a bottom of the flotation chamber for removing treated water.

13. (Original) The system of claim 12, wherein the photocatalyst comprises buoyant ceramic beads coated with titanium dioxide.

14. (Original) The system of claim 13, wherein the coated beads are from approximately 100 μm to 300 μm in diameter.

15. (Original) The system of claim 12, wherein the variable contour reflector comprises:

a movable frame having two side portions;

a central connecting member pivotally connecting the side portions of the frame;

at least two flexible straps attached between the side portions of the frame, the location of attachment being spaced from the central connecting member; and

a plurality of substantially vertical reflecting members disposed upon the straps having their reflective surfaces generally commonly oriented, forming a curved mosaic reflective surface;

whereby a user may adjust the contour of the reflective surface by pivoting the side portions of the frame so as to adjust the curvature of the straps.

16. (Currently Amended) A method of recapturing photocatalyst particles in a liquid, comprising ~~the steps of~~:

~~(a)~~ flowing a liquid downwardly through a reaction zone;

~~(b)~~ introducing buoyant photocatalyst particles into the downwardly flowing liquid, such that the photocatalyst particles are drawn downward through the reaction zone with the flowing liquid; and

~~(c)~~ recycling the particles through a catalyst recovery chamber by reducing the downward flow velocity of the liquid beyond a bottom of the reaction zone, such that the buoyant photocatalyst particles are allowed to float upward through the catalyst recovery chamber to the reaction zone for reintroduction into the downwardly flowing liquid.

17. (Currently Amended) The method of claim 16, further comprising ~~the step of~~:

~~(d)~~ directing light into the reaction zone such that the photocatalyst particles may promote chemical reactions within the liquid~~;~~.

18. (Currently Amended) The method of claim 16, wherein ~~the step of~~ reducing the downward flow velocity of the liquid beyond the reaction zone further comprises ~~the step of~~

discharging the liquid into a flotation chamber below the reaction zone, the flotation chamber having dimensions such that the velocity of the flowing liquid is substantially reduced from the downward velocity of the liquid in the reaction zone.

19. (Currently Amended) The method of claim 18, further comprising ~~the step of~~:

~~(e)~~ inducing rotational flow of the liquid about the center of the flotation chamber, such that the buoyant photocatalyst particles are urged toward an inlet to a catalyst recovery chamber approximately centrally disposed within the flotation chamber.

20. (Currently Amended) The method of claim 18, further comprising ~~the step of~~:

~~(f)~~ withdrawing the liquid from the flotation chamber.